Gold-silver nanoparticles instead of traditional diabetic drugs

Recently, we have published a pioneering work on green biosynthesis and complete characterization of gold and core shell silver-gold nanoparticles (AuNPs and Ag@AuNPs) via using green biopolymer in the influence of microwave radiation. These synthesized nanoparticles provide unprecedented opportunity for the design and development of nanomedicine through studying their potent influence as antidia-betic agent on streptozotocin induced diabetic rates. Although results conclude that Ag@AuNPs are more dominant in their effect than gold nanoparticles alone (AuNPs). Herein, the so obtained nanoparticles are assessed for their antidiabetic activity in streptozotocin-induced diabetic rats.

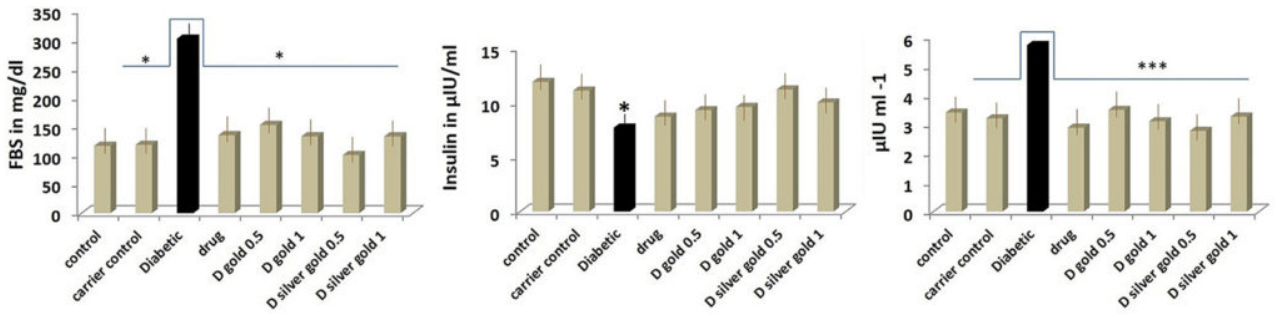

Fig. 1. Fasting blood sugar (* All P values are less than 0.0001), plasma insulin (** P value is less than 0.0001 except insulin in D gold 0.5 = 0.001 & in D silver gold 1 = 0.004) and Insulin Resistance (*** all p values are less than 0.0001) in different study groups.

Thus, sixty-four male albino rats were divided into eight groups: control untreated; diabetic rats; diabetic rats received standard drug; diabetic rats received carrier only; diabetic rats received 0.5 ml AuNPs; diabetic rats received 1 ml AuNPs; diabetic rats received 0.5 ml Ag@AuNPs and diabetic rats received 1 ml Ag@AuNPs for twenty-one days. Results revealed that diabetic rats treated with AuNPs or Ag@AuNPs restored normal glucose level. In particular, Ag@AuNPs was found to significantly induce a reduction in blood glucose and restore both the high serum insulin level and glucokinase activity compared to the control normal rats. The results obtained disclose the effectual role of Ag@AuNPs in reducing the lipid profile, an anti-inflammatory effect in diabetic rats assessed using inflammatory markers IL-a and C-reactive protein (CRP). Histopathological examination of diabetic rats signifies distortion in the arrangement of cells around the central vein, inflammatory cells, pyknotic and apoptotic nuclei. Kidney of diabetic rat appears with vacuolation and pyknotic nuclei of some tubules. On the other hand, the liver of diabetic rat treated with Ag@AuNPs displayed normal hepatic cells with only few necrosis of hepatocytes. Ag@AuNPs restored the increased number of caspase-3 stained cells in the liver and kidney tissue in diabetic rats.

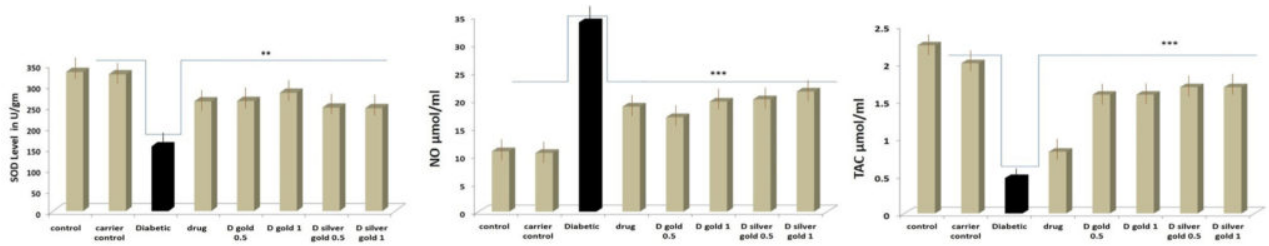

Fig. 2. SOD Level (** all P value is less than 0.0001), NO concentration and total antioxidant capacity (TAC; *** all P value is less than 0.0001) in different studied groups.

In short, both these nanoparticles (Ag@AuNPs) bring about reduction in blood glucose level, increase in insulin level, and reduction in insulin resistance as compared with the control group. They are also effective in reducing the lipid profile. In addition, AuNPs and Ag@AuNPs have an anti-inflamma-tory effect on diabetic rats assessed using inflammatory markers IL-a and CRP. The potential antioxidant property of AuNPs and Ag@AuNPs in controlling the oxidative stress mediated ROS generation and lipid peroxidation which is being proven in the present study may be due to inhibitory activity of gold nano-particles. Considering these findings, it is recommended that, colloidal AuNPs and core shell Ag@AuNPs may form the base for development of drugs that can be used as facile modulation. Noble nanoparticles in question will be more dynamic to interact with the targets if exposed to future studies. In conclusion, Ag@AuNPs was observed to improve diabetic condition by limiting prolonged inflammation, suppressing oxidative stress and elevating the antioxidant defense system in diabetic rats which subsequently evoke the potential impact of AuNPs as a cost effective therapeutic cure in diabetic treatments and its complications.

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Publication

Antidiabetic assessment; in vivo study of gold and core-shell silver-gold nanoparticles on streptozotocin-induced diabetic rats.
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